

AmiPur[®] -PLUS



*Most Advanced Amine Purification System
for the Removal of Heat Stable Salts
from Amine Circuits*



Why Continuous Purification of Amines?

Amine chemistry is commonly used in oil refining and gas processing for the removal of hydrogen sulfide and /or carbon dioxide in order to meet product specifications, emissions standards or other process requirements.

During operation various contaminants enter, or are produced, within the amine circuit. Contaminants included heat stable salts (HSS), solid particulates, and hydrocarbons.

Increased contaminant concentrations result in a number of operational problems such as corrosion of process equipment, greater foaming tendency, and less available amine. This can result in higher maintenance costs and reduced performance and capacity of the amine circuit.

Common Amines

that can be treated by AmiPur[®]-PLUS

- DEA
- MDEA
- DIPA
- DGA[®]
- MEA
- Sulfinol[®]
- Flexorb[®]

Common Heat Stable Salts (HSS)

that can be removed by AmiPur[®]-PLUS

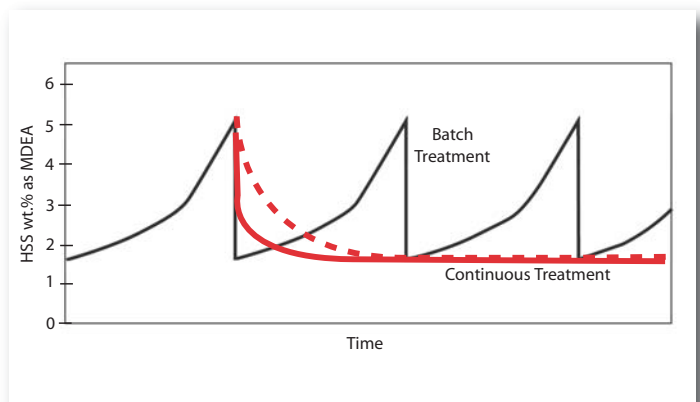
- formate
- acetate
- carbonate
- sulfate
- bicine
- chloride
- oxalate
- phosphate
- thiosulfate
- thiocyanate

Continuous purification of the amine solution results in stable, optimal performance of the amine circuit with low operating costs.

Batch vs. Continuous

Batch treatment such as purging, off-site treatment or on-site mobile services results in continuous changes to the amine circuit characteristics (i.e. corrosion, filtration requirements, foaming tendency, etc.) and operating challenges.

Continuous treatment results in low, stable HSS concentration with predictable amine characteristics. The amine circuit can be optimized for reliable, stable, economical operation.



Benefit

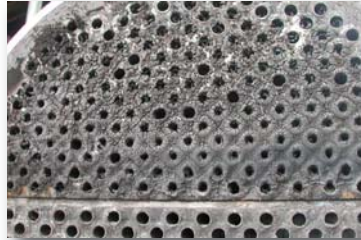
Reduced HSS = Reduced Corrosion of Process Equipment

Reason: Heat Stable Salts (HSS) accelerate corrosion by destroying the FeS passivation layer and by formation of acids and metal complexing chemicals.

Examples of equipment corrosion in amine circuits:



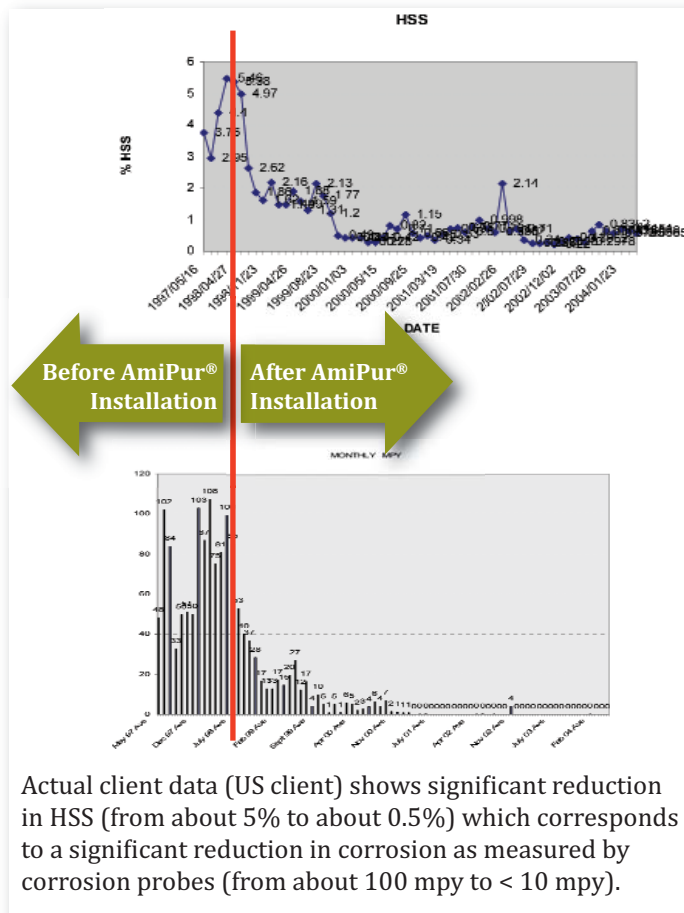
Reboiler Tubing



Lean/Rich Heat Exchanger



Lean/Rich Heat Exchanger



Additional Benefits of Reduced Corrosion:

- Reduced corrosion by-products mean less fouling of heat exchanger and contactor surfaces which improves heat transfer and so improves energy efficiency
- Costs associated with cleaning of fouled equipment are reduced or eliminated

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Benefit

Reduced HSS = Reduced Amine Filtration Costs

Reason: The most significant portion of the “dirt” in amine circuits is iron sulfide (FeS) which is a corrosion by-product. Reduced corrosion results in less dirt build-up on filters and longer filter life.

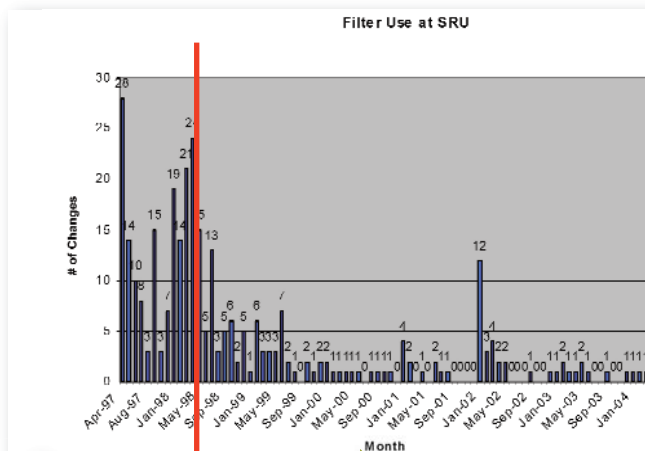


Filtration Costs include:

- Cost of replacement filter cartridges
- Labor to replace filter cartridges
- Disposal cost for dirty cartridges
- Associated amine losses

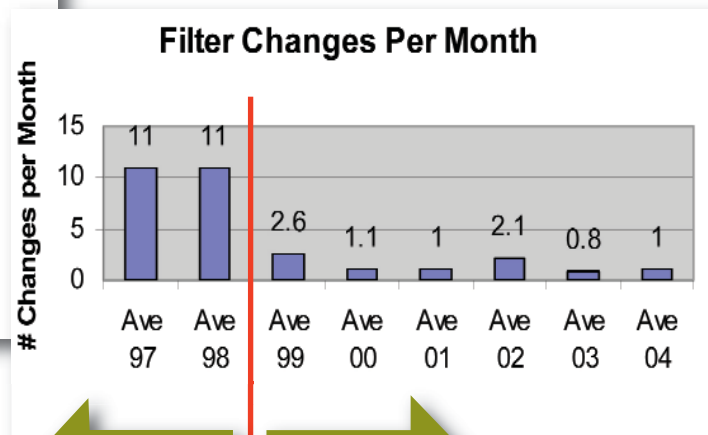
Plus safety concerns related to handling of cartridges containing iron sulfide (FeS).

Actual client data (U.S. refinery) indicates a significant reduction (90%) in filter changes after **AmiPur[®]** installation



Before AmiPur[®]
Installation

After AmiPur[®]
Installation



Before AmiPur[®]
Installation

After AmiPur[®]
Installation

Benefit

Reduced HSS = Improved Absorber Economy and Performance

Reason: Absorber economy and performance can be severely affected by foaming of the amine solution in the absorber. HSS and corrosion by-product solids make foaming more severe.

US Refinery Experience

Client Quote: "...height/breaker parameters changes from 450/23 to 50/4 and we observed less foaming which allowed us to eliminate the use of antifoaming additives..."

Reduced foaming is observed when HSS concentration is controlled. Absorber economy and performance are improved as follows:

- Reduce amine purchases to replace amine losses due to foaming.
- Improve reliability of meeting absorber specifications and eliminate off-spec production which may require blending or reprocessing.
- Operate amine absorber at maximum capacity - no need to derate due to foaming concerns.

Indian Refinery Experience

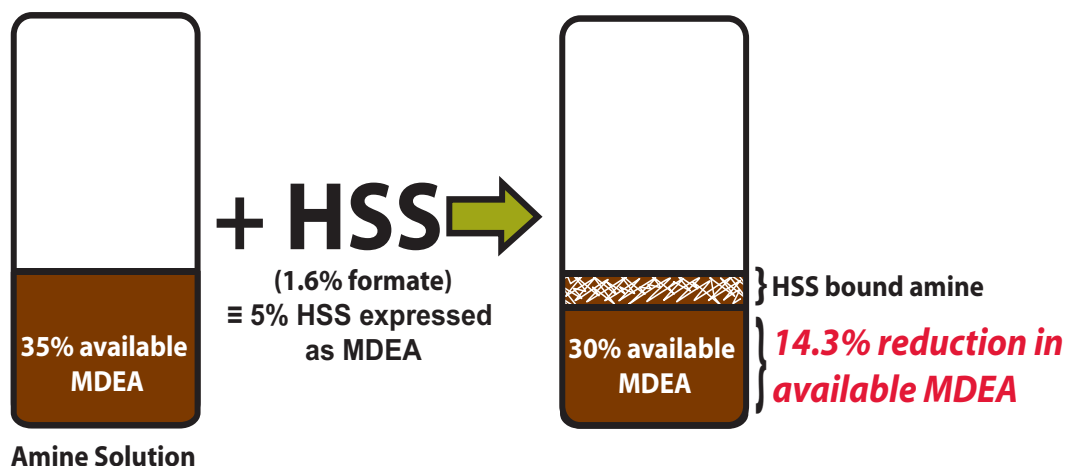
- Refinery and amine circuit commissioned in 1998
- By 2001, HSS had increased to 3.5% and foaming was a severe problem
- AmiPur® purchased and commissioned in 2002

Client Quote: "We are extremely satisfied with the AmiPur® unit. Our HSS in the system has come down from 3.2% to 0.9% in the last 4 1/2 months of operation. I am just a happy man now after three years of foaming, loss of amine, etc."

Benefit

Reduced HSS = More Active Amine Available

Reason: Heat Stable Salts combine with amines and reduce the amount of amine available for the process.



AmiPur[®]-PLUS

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What it is

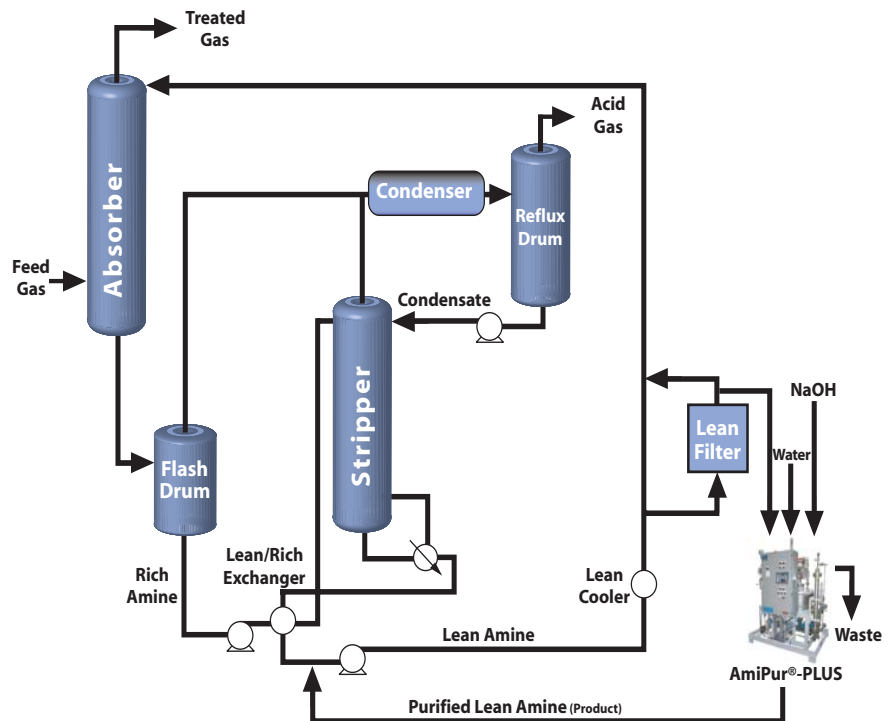
The Eco-Tec AmiPur[®]-PLUS is a compact, automated, skid-mounted equipment package which is integrated into the amine circuit. It operates continuously treating a slip stream after the lean amine cooler and filter in order to remove HSS from the circuit at a sufficient rate to offset the incursion rate (build-up) of HSS. This keeps HSS at a constant low level.

AmiPur[®]-PLUS is available in a range of standard models matched to provide the HSS removal capacity requirements for any site. Model selection and capacity requirements are determined by Eco-Tec based on data provided by the client in an engineering survey form.

How it works

AmiPur[®]-PLUS uses a proprietary, highly-efficient ion exchange process known as Recoflo[®]. Amine solution from a slip stream passes through a cartridge filter and ion exchange resin bed on the AmiPur[®] equipment skid.

Heat Stable Salts are removed from the amine solution and exchanged onto the resin, while the purified amine solution is returned to the circuit. After treating a fixed volume of solution, the unit automatically stops processing amine solution for a few minutes while it runs through a regeneration sequence during which water and caustic are passed through the resin bed to remove HSS from the resin and direct it to waste. Once the regeneration sequence is completed, the unit resumes treating amine solution.



Why AmiPur[®]-PLUS?

Advanced Technology

Amipur[®]-PLUS is based on Eco-Tec's proprietary, proven, Recoflo[®] ion exchange technology. Recoflo[®] incorporates such design features as:

- fine ion exchange resin beads for maximum surface area, smaller resin volumes and smaller equipment
- short, packed resin columns for efficient liquid resin contact and minimum waste generation
- counter-current regeneration for minimum chemical (caustic) consumption

Eco-Tec continues to develop product improvements and new processes with its in-house Research and Development facility

Quality Design and Construction



- ISO 9001 registered design and manufacturing facility
- Built to global oil refinery and gas processing standards
- Adaptable to meet specific company or refinery specifications
- Complete assembly and factory testing prior to shipment
- Compact, skid-mounted construction for minimal installation requirements

Proven Performance



- Eco-Tec has been building Recoflo[®] ion exchange systems for industrial chemical purification applications since 1970 with more than 1500 systems installed in more than 55 countries
- More than 50 AmiPur[®] systems have been installed in refineries and gas plants world-wide including a number of repeat clients
- Eco-Tec is the leading supplier of continuous amine purification systems in the world

Technical Service and Support



- On-site commissioning supervision, performance demonstration, and operator training
- Performance monitoring and technical support program (Eco-SERV[™])
- 24/7 telephone access to technical services support
- Extensive spare parts inventory for next day shipment of most replacement parts

Growing List of AmiPur®-PLUS Clients (Many are repeat clients)

Shell	PEMEX	BP
Sunoco	Enbridge	Sinopec
Kinder Morgan	Chevron	Reliance
Duke Energy	Vintage	Essar
Marathon	Tampa Electric	PDVSA
CITGO	Krakatau Steel	GALP
Lyondell	Petrox	OGDCL
Praxair	Amoco	Williams
Pasadena Refining	OXY USA	Valero

Other Eco-Tec Products

HSS-PAK™ (Heat Stable Salt Portable Analysis Kit)

A quick, easy-to-use kit to allow consistent monitoring of heat stable salts in amines.

AmiPur®-CCS

AmiPur® designed for HSS removal in CO₂ Capture and Sequestration (CCS) applications.

GlycoPur™

Removal of chloride and other salts from glycol solutions.

BgPur™

Highly efficient, compact and economical gas treatment systems for removal of H₂S from biogas (landfills, anaerobic digesters) and sweep air (sulfur handling).

Water Softening and Demineralization

High performance water treatment systems for boiler water, produced water and other process water applications.

For more information, or to request a proposal, visit our website or contact:

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