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Maintenance Considerations for Pumps Used in Amine Treating Applications

By Todd Keefe, November 2026



Heavy duty pumps used in Amine treating and other hydrocarbon processing applications are designed to run for decades. The initial cost of a pump deployed in these applications is approximately 15 percent of the total lifecycle cost. Operating/energy expenses can consume another 40 percent of lifecycle costs, leaving almost half of the total costs to maintenance and optimization. For this reason, it's critical to streamline maintenance activities that keep pumps operating at optimal conditions.

When raw gas exits a well, it contains methane (CH_4), with smaller amounts of water (H_2O), ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}), carbon dioxide (CO_2), nitrogen (N_2) and hydrogen sulfide (H_2S). Removing impurities and heavier hydrocarbons (which can be sold as byproducts) produces pipeline quality,



methane-rich natural gas, which can be liquified, or sent to power plants.

Amine scrubbing is an important gas treating application. It removes impurities from a gas stream by pumping aqueous alkylamine solutions onto the raw gas to absorb hydrogen sulfide (H_2S) and carbon dioxide (CO_2).



Integrally geared pump with mechanical seals

"Lean" amines chemically react with raw gas, causing impurities to transfer onto the amine solution. Removing H_2S and CO_2 creates "sweet gas" (mostly methane), which exits the "absorber" while the rich amines bring impurities to a stripper/regenerator. Intense heat breaks the chemical bonds between the rich amines and the absorbed acid gases. Once regenerated, the amines (now returned to a lean state) are cooled and reused.

This process is repeated multiple times. In simple terms, amine treating is like

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a reusable chemical sponge that picks up impurities from natural gas, gets heated to release the impurities, and then goes back around to pick up more. Pumps play a critical role in moving amines through the absorber and regenerator parts of the process.

Primary Maintenance Activities for Pumps in Amine Scrubbing

Amine solutions, such as monoethanolamine (MEA), diethanolamine (DEA) or methyldiethanolamin (MDEA) are hot, abrasive and chemically active substances.

They can cause a variety of issues for pumps, including corrosion, cavitation and seal leakage. To prevent this, maintenance personnel should focus on the following:

Seal Inspection & Maintenance:

Amine pumps handle aggressive chemicals and operate at highly elevated temperatures. Seal arrangements are an important design consideration that impacts safety and maintenance.



Sealless Magnetic Drive Pump

Maintenance personnel should actively monitor seal temperatures, seal flush/cooling, elastomer conditions, and should check for shaft/sleeve wear. It's important to have replacement seals readily available.

Some amine treating units use sealless magnetic drive pumps, which replace mechanical seals with a static containment shell or shroud that forms a completely sealed liquid end or pressure boundary that removes any potential leak paths. Removing the seals removes a common point of failure. It also simplifies maintenance, because sealless magnetic drive pumps have fewer working parts, and do not require seal support systems.

Bearings and Vibration:

Routine vibration monitoring is another important activity. Maintenance teams should look for increased vibration, or for any imbalance or misalignment. Tracking vibration trends is more useful than single or occasional vibration measurements.

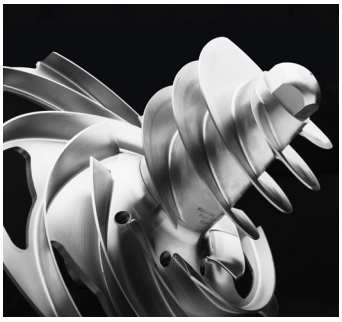
Cavitation:

Amine pumps can be particularly sensitive to suction conditions. It's important to select pumps with lower Net Positive Suction Head Required (NPSHR), than the system's Net Positive Suction Head Available (NPSHA). NPSHA is the fluid pressure energy available at the suction port of a pump, minus the fluid's vapor pressure. If the pressure at the pump suction gets too low, vapor bubbles can form. If vapor bubbles move inside the pump, they collapse and cause cavitation.

In an Amine treating unit, NPSHA is a function of the piping and the entire amine system, while NPSHR is a characteristic of the pump itself. In Amine units, suction conditions can decline when absorber/stripper liquid levels drop, or when amine temperature rises. Any resulting cavitation in the pump can damage the bearings or the impeller, which could eventually lead to a pump failure. To avoid this, suction pressure and temperature should be monitored as part of preventive maintenance.

Impeller Inspection:

The condition of the impeller has a direct effect on head and flow. During turnarounds, maintenance technicians should look for corrosion, or any loss of material on the impeller from chemical attack. Accumulated deposits should be removed, and if signs of wear are noticeable, the impeller should be replaced, as unintended changes in clearances on the impeller will reduce hydraulic efficiency.



A pump's impeller has a direct impact on NPSH, flow and head.

Coupling:

Alignment between the pump and the motor should be checked during routine maintenance. Any misalignment issues can cause unwanted vibration, bearing wear and mechanical-seal problems. Laser alignment is helpful because even small alignment errors can create substantial forces at high operating speeds.

Oil Changes:

For a centrifugal pump used in amine treating, oil-change intervals are generally based on bearing temperature, oil condition, contamination, and a pump manufacturer's recommendations. A variety of factors can warrant more frequent oil changes, such as water or amines entering the bearing housing, high bearing temperature, particulate contamination or any mechanical-seal or shaft-seal leakage. If any of these conditions are detected, the pump's oil should be changed, and the source of contamination should be investigated.

Typical Maintenance Guidelines:

Amine-service pumps are good candidates for condition monitoring and predictive-

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maintenance programs that feature a combination of continuous and periodic activities.

Continuous monitoring should be conducted for vibration, bearing temperature, seal leakage, suction/discharge pressure and flow rates. Periodic/preventive maintenance activities can include coupling inspection, alignment verification, seal inspection, bearing condition assessment, and performance testing.

Aftermarket Services:

Site Surveys:

The pump condition and maintenance activities referenced above can be complemented with site surveys, as field-service engineers often bring unique insights to troubleshooting "bad-actor" pumps. Site surveys provide start-up assistance for new & repaired units. They offer a quick and convenient way to replenish spare parts inventories, and they can bring a fresh perspective for recommending options such as impeller upgrades or gearboxes refurbishments.

Re-Rates:

If process conditions change and operators identify units not running near Best Efficiency Point (BEP), then hydraulic re-rates can help to get things back on track. Efficiency improvements are achievable without requiring a new motor, footprint or piping. In some instances, re-rates can provide up to 25 percent additional head with up to 10% power savings.

Why Amine Treating Matters:

Natural gas is one of the world's most important energy sources. It's widely used for electricity generation, heating and as a feedstock for petrochemicals. New data centers, and surging demand for LNG in Asia and around the globe continue to increase demand for natural gas, and amine treating is required to clean natural gas before it can be transported, sold and used.

Removing H_2S and CO_2 from gas streams via amine treating prevents corrosion in pipelines, valves, vessels and heat exchangers. Pipeline operators typically impose strict limits on H_2S, CO_2 and water content. Carbon dioxide does not have any useful heating value, but it takes up space, so removing it improves the quality and value of the gas.

Amine units are a critical part of transforming raw natural gas into a sales-quality product. The pumps that move amine solutions must be designed to handle the task, and they must be meticulosity maintained to operate safely and efficiently.

To learn more, please visit: www.sundyne.com.



About the Author:

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