The CONTACTOR™

Published Monthly by Optimized Gas Treating, Inc.
Volume 9, Issue 4, April, 2015

An Odd Regenerator?

This issue of The Contactor™ focuses on an MDEA regenerator. It draws attention to a peculiarity of processing using fully-lean and semi-lean amine streams (a so-called split flow configuration). In such a processing scheme it's not unusual to find a *much* higher amine concentration in the fully-lean stream than in the normally higher flow rate, semi-lean solvent.

Case Study: CO_2 Removal in a Gas Plant

The case involves removing the H_2S from nearly 200 MMscfd of predominantly methane containing 5.5% H_2S and 4.8% CO_2 at about 55 barg. The total solvent flow is about 2,000 USgpm of nominally 48 wt% MDEA. Processing is in two parallel trains with each regenerator being fed with about 1,000 USgpm of rich amine with a total acid gas loading of 0.42 mol/mol. Of the total amine flow, 78% is withdrawn from part way down the regenerator and is sent to the corresponding absorber as semi-lean solvent. The remainder continues down the regenerator and exits from the reboiler as fully-lean solvent. The flow diagram in Figure 1 shows the piping arrangement for one of

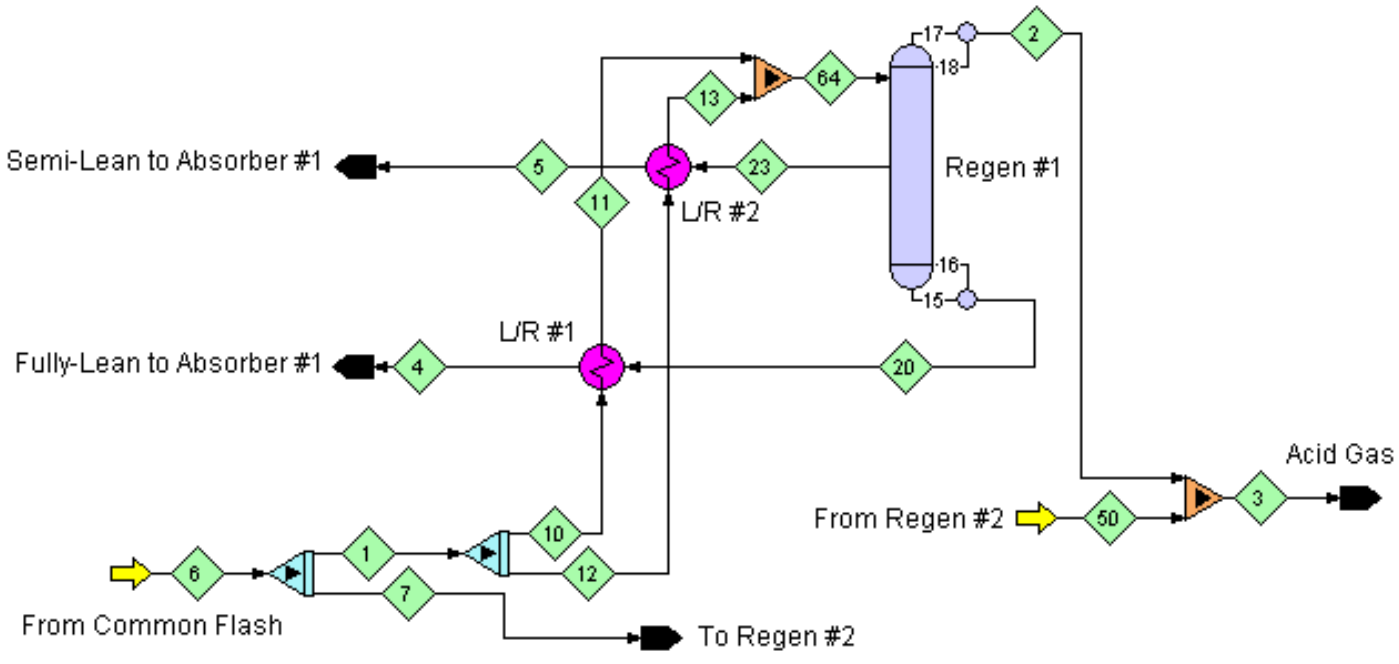

Figure 1 A Single Regenerator in a Parallel Train Split-Flow Amine System

the regenerators. The total solvent flow to one of the trains enters the top as Stream 64. Semi-lean is drawn from Tray 13 (from the top) of the tower as Stream 23 and is cross-exchanged against a fraction of the rich solvent which has been split from the total flow as Stream 12. The hot stripper bottoms (Stream 20) is cross-exchanged using the balance of the rich solvent flow (Stream 11).

The reboiler duty is sufficient to provide a reflux ratio of 1.07 and a stripping ratio of 1.14. The rich amine enters the regenerator at 48 wt% MDEA while semi-lean (Stream 23) is 46 wt% MDEA. Semi-lean leaves the regenerator with a lean loading of 0.01. Slight dilution of the amine is the result of the condensation of steam which provides the heat needed to drive stripping. The fully-lean solvent is predicted to have a total loading of 0.0013 but with amine strength of 66.6 wt%! The engineer running the simulation was surprised to see such a high MDEA concentration.

Sufficient steam must be provided to the upper section of the regenerator to heat the rich solvent to its bubble point, *and* to allow the bulk of the acid gases to be removed from the solvent while at the same time providing a value of the reflux ratio near unity. To achieve this, the reboiler must generate roughly 58,000 lb/h of steam. However, the side draw removes 78% of the solvent so 58,000 lb/h of water must be generated from only a relatively small solvent flow. This increases the MDEA concentration in the fully lean stream to nearly 67 wt%.

The lesson is that unless a split-flow plant is very carefully designed, one may find very high amine concentrations in the fully-lean solvent feeding the top of the absorber. If that happens, the solvent viscosity will be very high and absorption rates may be seriously reduced.

~.~

To learn more about this and other aspects of gas treating, plan to attend one of our training seminars. Visit www.protreat.com/seminars for details.

ProTreat® and ***The Contactor***™ are trademarks of Optimized Gas Treating, Inc.