

Tips on Upgrading Triethylene Glycol Contactors for Gas Plants

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The high demand for natural gas is requiring gas plants to process gas at full capacity. Still, demand is higher than supply. One economic way to increase existing plant capacity is to revamp the Triethylene Glycol Contactor (TEG).

The gas dehydration unit is one of the key units in a gas plant. The most common process used for water saturated natural gas dehydration is contacting the gas with 98% to 99.99% TEG. This is done to remove water to less than seven pounds per million standard cubic feet of gas. Typically, an older gas dehydration unit has a contactor tower fitted with four to twelve bubble cap trays. Consecutive trays are usually spaced 24-inches apart. Based on the tower diameter, along with the number of trays and tray spacing, a contactor has a certain maximum gas throughput capacity. (Usually, liquid capacity is not an issue because a typical contactor is designed for a very high gas to liquid ratio.)

Changing from bubble cap trays to structured packing can increase capacity up to 240%...

In the last ten to fifteen years, gas plant owners have been revamping the TEG contactors to increase capacity. The most popular and effective measure is to change the contacting device from bubble cap trays to structured packing. This change offers a capacity increase of between 150 to 240 percent for the same operating temperature, pressure and gas-specific gravity.

Two examples are considered here. One is a 12-inch inside diameter tower equipped with twelve (12) cartridge type bubble cap trays. The other is a 66-inch diameter column equipped with six (6) removable bubble cap trays supported on two-inch wide support rings. The following table gives the gas capacities of the bubble cap and structured packing for the two columns.

Structured packing requires at least a packing support and a liquid distributor and in some instances a packing hold-down plate. Structured packing is typically available in 6.5 to 12-inch thick layers. A layer can be a single piece for a small diameter column with an access through a full diameter body flange opening or segmented in a number of pieces to pass through a manway access. The liquid rate for a TEG contactor can be as low as 0.05 gallons per minutes per square foot of the column cross section area. This requires a carefully designed high performance liquid distributor. The packing support and the packing hold-down must not block more than ten percent of the tower cross section area. A packing hold-down is generally not required if the installation of the packing and the internals are done in the field with the tower standing in place. If the column is brought to a workshop, the packing and internals can be installed in the shop with the column in a horizontal position. However, this requires special devices to prevent damage to the packing while in transit. A packing hold-down is required in this case to prevent the packing from shifting.

Replacing cartridge type bubble cap trays with structured packing...

Replacing cartridge type bubble cap trays with structured packing is fairly simple. The packing support can be placed on the supports for the tray cartridges. The full diameter packing layers rest on the packing support. Once all the layers are in place, the liquid distributor goes on top. The liquid distributor can be designed with an annular ring that is then installed in the body flange of the tower. The liquid distributor can also have a built-in packing hold-down.

There are several ways to retrofit larger columns with structured packing...

Larger columns, 24-inches and higher in diameter with segmental trays supported on rings, may be retrofitted with structured packing in several ways. One way is to grind out the rings for all trays except the top and bottom trays. If the top and bottom rings are partial, add segments and complete these two rings. The down comers must also be removed and the down comer bars grinded out. The bottom ring will now support both the packing support and the top ring for the high performance liquid distributor. The packing layers must be segmented to pass through the tower manway. If a slightly less capacity increase is tolerated, the structured packing layers can be made to fit between the consecutive support rings. However, the down comer and the down comer bolting bars must be removed.

Don't forget the mist eliminator...

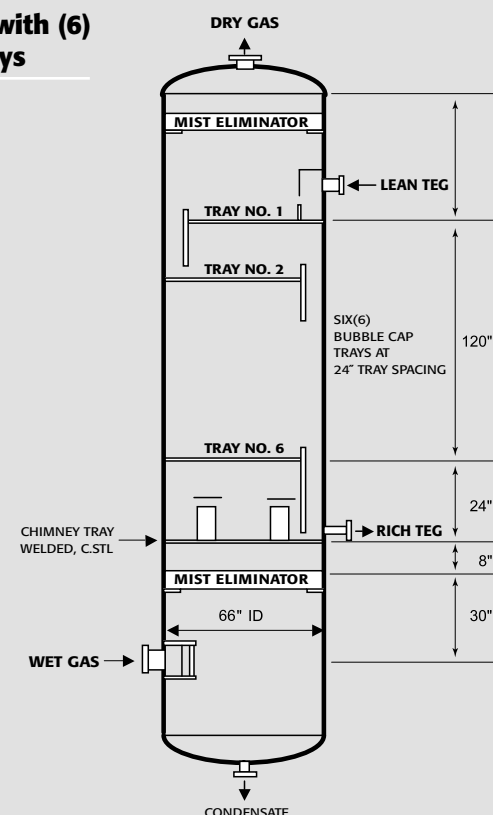
The mist eliminator is also an integral part of the contactor. It must be upgraded to match the higher capacity. Replacing the existing wire mesh mist eliminator with a vane type mist eliminator is generally sufficient. However, the entrained TEG losses may be at the borderline. A high performance mesh-vane combination mist eliminator may reduce the TEG losses down to 0.01 US gallon per mmscf of the dehydrated gas from a typical specification of 0.1 US gallon per mmscf. This translates into an approximate savings of 8200 US gallons of TEG per year.

Get better performance with a mesh-vane combination...

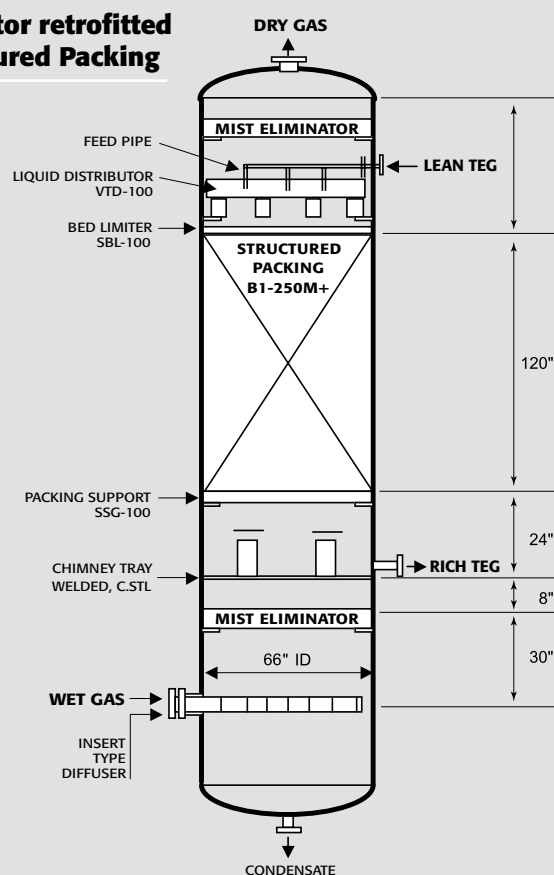
A typical TEG contactor will also have an integral inlet scrubber at the bottom along with the mist eliminator. This mist eliminator also needs to be upgraded. Replacing it with a high performance mesh-vane combination can enhance the overall performance of the contactor by reducing foaming due to the interaction between TEG and fine droplets of hydrocarbon condensate.

Last, but not least, the size of the inlet gas nozzle must be checked. It most likely will be undersized for the new flow rate but a properly designed insert-type feed diffuser can take care of the situation quite well. For more information on proper revamping to increase the TEG unit in your gas plant, contact the Separations & Mass Transfer experts at ACS Industries, Inc., Call 713-434-0934 or 1-800-31-0077
E-mail: separations@acsind.com
Or visit www.acsseparations.com

TEG Contactor with (6) Bubble Cap Trays



TEG Contactor retrofitted with Structured Packing



Column Diameter Inches	Operating conditions			Gas capacity, mmscfd	
	Temp. Deg. F	Pressure Psig	Gas Sp. Gr.	Bubble Cap trays	Structured packing
12	120	610	1.46	1.49	3.4
66	100	1000	0.6	100	232